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for all educated people, the normal medium for thought about number relations and for expression of that thought. These statements were made by Professor Wester on the basis of tests given in the classroom.

5. In fitting parabolic curves by the method of least squares or by the method of moments a normal system of equations is formed whose determinant was given. Professor Smith showed that for certain useful sets of values this determinant may be reduced to a simple expression whose numerical value is easily computed.

6. In this paper Professor Rietz gave an exposition of the meaning of the Lexis ratio as it arises in the comparison of Poisson and Lexis distributions with corresponding Bernoulli distributions. He then showed how to apply this criterion to experiments with games of chance and to actual statistical data, and emphasized that we may obtain from this criterion important indications as to whether the dispersion has its foundation in a constant probability or in probabilities with certain types of variation.

7. Professor Allen's paper has been published in this MONTHLY, *1922*, 301.

8. In this paper Professor Reilly represented by ${}^aH_m{}^{a-k}$ the sum of all the products of degree $m$ that can be formed from the quantities $a$, $a-1$, $a-2$, $\cdots$, $a-k$, putting ${}^aH_0{}^{a-k} \equiv 1$. Then he showed that if $m$ and $k$ be each given the values 0, 1, 2, 3, $\cdots$, $a$ being arbitrary, a system of numbers is obtained similar to but more general than the figurate numbers. The law of formation of this system of numbers is

$${}^aH_{m+1}{}^{a-k} \equiv {}^aH_{m+1}{}^{a-k+1} + (a-k)\,{}^aH_m{}^{a-k}.$$

These numbers were found useful in reducing a certain type of determinant.

JOHN F. REILLY, *Secretary-Treasurer.*

# THE MAY MEETING OF THE MARYLAND-VIRGINIA-DISTRICT OF COLUMBIA SECTION.

The eleventh regular meeting of the Maryland-Virginia-District of Columbia Section of the Association was held at the United States Naval Academy, Annapolis, Maryland, on Saturday, May 13, 1922. The Chairman of the Section, Mr. O. S. Adams, presided at both morning and afternoon sessions.

There were sixty-two in attendance, including the following forty-two members of the Association: O. S. Adams, J. J. Arnaud, R. N. Ashmun, H. G. Avers, E. A. Bailey, A. J. Barrett, Sarah Beall, G. A. Bingley, C. C. Bramble, J. A. Bullard, Paul Capron, G. R. Clements, A. Cohen, L. S. Dederick, A. Dillingham, J. B. Eppes, Harry English, J. N. Galloway, W. M. Hamilton, W. E. Heal, P. E. Hemke, Nelle L. Ingels, R. P. Johnson, L. S. Johnston, W. D. Lambert, J. J. Luck, E. S. Mayer, Frank Morley, C. A. Mourhess, F. D. Murnaghan, J. R. Musselman, C. A. Nelson, E. C. Phillips, O. J. Ramler, C. H. Rawlins, Jr., J. N. Rice, M. R. Richardson, H. M. Robert, Jr., R. E. Root, W. F. Shenton, C. A. Shook, T. McN. Simpson, Jr.

Those in attendance at the meeting were guests of the Department of Mathematics of the Naval Academy for lunch. At the close of the afternoon session the program was varied by visits to points of interest about the Naval Academy, or to some of the athletic contests in progress there.

The officers elected for the year 1922–1923 are: FRANK MORLEY, Chairman; G. R. CLEMENTS, Secretary-Treasurer; W. D. LAMBERT and T. McN. SIMPSON, Jr., additional members of the executive committee. The twelfth regular meeting of the Section will be held in December, 1922, probably in Washington, D. C.

The following papers were presented:

(1) "Self-inverse curves" by Professor FRANK MORLEY;

(2) "The significance of assumptions" by Professor T. McN. SIMPSON, Jr.;

(3) "Remarks on the theory of relativity" by Professor F. D. MURNAGHAN;

(4) "On Græffe's method for the numerical solution of algebraic equations" (illustrated) by Professor L. B. TUCKERMAN, Bureau of Standards (by invitation).

(5) "The parallax of the moon and the ellipticity of the earth" by Mr. W. D. LAMBERT.

Abstracts of the papers follow:

1. Professor Morley's paper was, in brief, as follows: An equation of an algebraic plane curve, when written in conjugate coördinates, gives immediately the images of points in the curve. The successive images give an expression for Green's function. The cases when the image closes are naturally of interest. Then a point on the curve, which is one of its own images, will have other images on the curve. Such a curve may properly be called self-inverse.[1] A principal theorem on such curves is that if there be an isogonal mapping such that $n$ points of one plane correspond to a single point of another plane, then to a line of the second plane will correspond a self-inverse curve of the first plane.

2. Professor Simpson began by quoting President Eliot who has said that "the main reason for the painfully slow progress of the human race is to be found in the inability of the great mass of people to establish correctly the premises of an argument." All thought starts with assumptions; they may be explicit or implicit, recognized or unrecognized. Out of implicit and unrecognized assumptions sophistry is bred. Failure to recognize assumptions as such has been the source of much bitter controversy, builders having sought to preserve the scaffoldings of thought as part of the permanent structure. Science is essentially pragmatic; the question of truth is the question of the truth of assumptions and its test is the test of experiment and experience.

Mathematics is perhaps more explicit in its assumptions than any other subject introduced into the curriculum at an early stage. It is better suited than any other to develop the sense of the significance of assumptions as well as the logical sense. The social significance of mathematics is to lie perhaps in its contribution to the building of a social consciousness which shall recognize that the stabilization of our institutions rests ultimately upon our ability to know and to test our assumptions, and upon a willingness to revise them without partisanship, or bitterness, or distress.

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[1] Self-inverse curves and surfaces have been termed by the French " anallagmatic "—EDITOR.

3. Professor Murnaghan's remarks were elementary and informal. They were directed to an exposition and criticism of several recent articles on relativity, showing in a simple manner just what mathematical problems the writers had set for themselves and to what extent satisfactory conclusions had been secured. Some work by Whitehead was examined with particular care.

4. Professor Tuckerman pointed out that the method for the solution of numerical algebraic equations published by Græffe in 1837 and developed and perfected by Encke in 1841, and later by Runge and other German mathematicians, is almost completely ignored in English and American text books. Illustrations using a computing machine and also a slide rule were given, both for real and complex roots. Attention was called to an erroneous statement, that "no reliable estimate of the error (of the roots) can be given." The computational errors of the method were discussed and a simple expression for the upper limit to the error in the modulus of any root was derived. For determination of the amplitude of the complex roots, Encke's method is preferable in the case of one or two pairs. When three or more pairs are present, a displacement of the zero is to be recommended. The method was extended by a simple process to equations with complex coefficients, and an illustration of the solution was given. The author believes that Græffe's method deserves more attention than it has received, and that in many cases it is to be preferred to the better known Horner's and Newton's methods, because of its generality, simplicity, and directness of attack.

5. Mr. Lambert's paper gave a brief account of the theory by which Sir Isaac Newton connected the force governing the motion of the moon with terrestrial gravity. When all necessary refinements are introduced (involving, for example, the ellipticity of the earth), the fundamental equation of the theory may be used to compute the parallax of the moon; the parallax so obtained may be called the "dynamic parallax." The dynamic parallax does not agree with the parallax determined by direct observation at Greenwich and Cape of Good Hope, unless a rather large ellipticity of the earth is assumed, namely, about 1/293 instead of 1/297, the value which is generally accepted as nearly correct. This discrepancy in the ellipticities is rather larger than can reasonably be attributed to observational error in the parallax or to uncertainties in the other assumed data of the fundamental equation. The explanation is probably to be looked for in the deflections of the plumb lines at Greenwich and the Cape, amounting sometimes to $30''$ or more. Deflections there of about $10''$ would reconcile the observed and dynamic values of the parallax for an ellipticity of 1/297. A computation of the effects of surface irregularities represented by the topography within radii of 2,500 miles of Greenwich and the Cape, with allowance for isostatic compensation, indicates deflections of the vertical in the right direction but by only about one fourth of the requisite amounts. The results, however, could be changed by changing the hypothetical distribution of isostatic compensation. A further partial explanation of the discrepancy might be found if we accept Helmert's determination of the figure of the earth as a triaxial ellipsoid. The detailed discussion will probably be published by the U. S. Coast and Geodetic Survey.

G. R. CLEMENTS, *Secretary-Treasurer.*